

REMARKS/ARGUMENTS

Claims 1-5 & 7 are rejected under 35 USC 103(a) as being unpatentable over Tanabe et al in view of Akahira.

The Examiner states that Tanabe differs from the claim of the present invention in that the present claims require a concentration of oxygen dissolved in the ink to be 0.1 to 2 ppm at 25°C. However, the Examiner asserts that Akahira renders it obvious to improve the ink discharge stability, by requiring the amount of oxygen dissolved in the ink to be less than 1 ppm.

Akahira teaches a technique to jet ink onto an ink absorbing resin layer, the ink being capable of being set by irradiation of light, (see column 8 lines 19 to 40). With regard to the ink, Akahira merely teaches on column 8 lines 49-51 that as the ink used for coloring, dyes and pigment are available, and further, both liquid ink and solid ink are available.

From the above teachings, Akahira teaches nothing about the UV-setting ink-jet ink of the present invention. As a matter of fact, Akahira teaches nothing about a process to irradiate ink with light.

In the portions (column 12 lines 57-67, column 13 lines 1-5) pointed to by the Examiner, Akahira merely teaches to eliminate

oxygen from ink as far as possible in order to improve ink discharge stability.

The present invention is concerned with solving a specific problem for a specific ink which is applied by an inkjet nozzle. The technique of the present invention to have ink contain oxygen in an amount of 0.1 ppm to 2 ppm in order to refrain or inhibit polymerization of ink on the nozzle. This problem and solution are not obvious from Akahira.

As required in claim 1, a UV-setting ink-jet ink of the present invention comprises color materials, UV-polymeric compound containing a radical polymeric compound, and photo-induced polymerization initiator in a water-based medium, wherein a concentration of oxygen dissolved in the ink is 0.1 to 2 ppm at 25°C.

As was explained in the previous response, the radical polymeric compound has a very high reactivity. Therefore, when the UV-setting ink-jet ink is jetted on a recording sheet so as to form an ink droplet and the droplet is irradiated with UV rays, polymerization in the droplet is started by the action of the photo-induced polymerization initiator, and then the polymerization is conducted rapidly by the action of the radical polymeric compound, thereby the droplet is hardened rapidly.

The problem is that when an ink droplet adheres on a nozzle surface after jetting, the above polymerization takes place in the adhered ink droplet as a result of UV rays leaking from the UV light source to irradiate the recording sheet. As a result, the adhered ink droplet is hardened, and then the hardened ink droplet on the nozzle surface causes irregular ink jetting from the nozzle. Especially, the above unnecessary polymerization easily takes place when the UV-polymeric compound contains the radical polymeric compound.

In order to avoid the above unnecessary polymerization, in the UV-setting ink-jet ink of the present invention, the ink is required to contain oxygen in an amount of 0.1 to 2 ppm at 25°C. In other words, the inventor learned that the dissolved oxygen has the ability to refrain or inhibit the polymerization, (page 7 lines 1-7).

As described in pages 15-16, comparative tests were conducted for 3 inks having concentrations of oxygen dissolved in ink of 0.6 ppm, 0.08 ppm and 8.5 ppm respectively.

In the ink having concentrations of oxygen dissolved in ink of 0.08 ppm, after a 2-hour continuous recording, some of ink-jet nozzles were bent and blocked. Solid or gummy inks were found on the ink jet nozzle plate.

In the ink having concentrations of oxygen dissolved in ink of 8.5 ppm, after a 2-hour continuous recording, ink jet were not conducted properly due to cavitations.

In contrast, in the ink having concentrations of oxygen dissolved in ink of 0.6 ppm, after a 2-hour continuous recording, inks were jetted out successfully even after such a long continuous recording.

Above unexpected result according to the invention would not have been obvious, even if taking Tanabe and Akahira.

Withdrawal of the rejections are therefore respectfully requested.

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